

# Mecklenburg County Common Code Defects

## Mechanical

### Code Defects

- Duct installation incorrect

### Code Description

#### DUCT CONSTRUCTION AND INSTALLATION

**603.1 General.** An air distribution system shall be designed and installed to supply the required distribution of air. The installation of an air distribution system shall not affect the fire protection requirements specified in the International Building Code. Ducts shall be constructed, braced, reinforced and installed to provide structural strength and durability. For one and two family dwellings and townhomes, supply and return ducts shall be allowed to be sized according to ACCA Manual D or SMACNA Installation standards for Residential Heating and Air Conditioning systems.

**603.2 Duct classification.** Ducts shall be classified based on the maximum operating pressure of the duct at pressures of positive or negative 0.5, 1.0, 2.0, 3.0, 4.0, 6.0, or 10.0 inches of water column. The pressure classification of ducts shall equal or exceed the design pressure of the air distribution in which the ducts are utilized.

**603.3 Metallic ducts.** All metallic ducts shall be constructed as specified in the SMACNA HVAC Duct Construction Standards --Metal and Flexible.

**EXCEPTION:** Ducts installed within single dwelling units shall have a minimum thickness as specified in Table 603.3.

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**TABLE 603.3**  
**DUCT CONSTRUCTION MINIMUM SHEET METAL**  
**THICKNESSES FOR SINGLE DWELLING UNITS**

DUCT SIZE	GALVANIZED STEEL		APPROXIMATE ALUMINUM B&S GAGE
	Minimum Thickness (inches)	Equivalent Galvanized Gage No.	
Round ducts and enclosed rectangular ducts 14" or less Over 14"	0.013	30	26
	0.016	28	24
Exposed rectangular ducts 14" or less Over 14"	0.016	28	24
	0.019	26	22

**603.4 Nonmetallic ducts.** Nonmetallic ducts shall be constructed with Class 0 or Class 1 duct material in accordance with UL 181. Fibrous duct construction shall conform to the SMACNA *Fibrous Glass Duct Construction Standards* or NAIMA *Fibrous Glass Duct Construction Standards*. The maximum air temperature within nonmetallic ducts shall not exceed 250°F (121°C).

**603.4.1 Gypsum ducts.** The use of gypsum boards to form air shafts (ducts) shall be limited to return air systems where the air temperatures do not exceed 125°F (52°C) and the gypsum board surface temperature is maintained above the airstream dew-point temperature. Air ducts formed by gypsum boards shall not be incorporated in air-handling systems utilizing evaporative coolers.

**603.5 Flexible air ducts and flexible air connectors.** Flexible air ducts, both metallic and nonmetallic, shall comply with 603.5.1, 603.5.1.1, 603.5.3 and 603.5.4. Flexible air connectors, both metallic and nonmetallic, shall comply with 603.5.2 through 603.5.4.

**603.5.1 Flexible air ducts.** Flexible air ducts, both metallic and nonmetallic, shall be tested in accordance with UL 181. Such ducts shall be listed and labeled as Class 0 or Class 1 flexible air ducts and shall be installed in accordance with 304.1.

**603.5.1.1 Duct length.** Flexible air ducts shall not be limited in length.

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**603.5.2 Flexible air connectors.** Flexible air connectors, both metallic and nonmetallic, shall be tested in accordance with UL 181. Such connectors shall be listed and labeled as Class 0 or Class 1 flexible air connectors and shall be installed in accordance with 304.1.

**603.5.2.1 Connector length.** Flexible air connectors shall be limited in length to 14 feet (4267 mm).

**603.5.3 Air temperature.** The design temperature of air to be conveyed in flexible air ducts and flexible air connectors shall be less than 250°F (121°C).

**603.5.4 Flexible air duct and air connector clearance.** Flexible air ducts and air connectors shall be installed with a minimum clearance to an appliance as specified in the appliance manufacturer's installation instructions.

**603.6 Rigid duct penetrations.** Duct system penetrations of walls, floors, ceilings and roofs and air transfer openings in such building components shall be protected as required by 607.

**603.7 Underground ducts.** Ducts shall be approved for underground installation. Metallic ducts not having an approved protective coating shall be completely encased in a minimum of 2 inches (51 mm) of concrete.

**603.7.1 Slope.** Ducts shall slope to allow drainage to a point provided with access.

**603.7.2 Sealing.** Ducts shall be sealed and secured prior to pouring the concrete encasement.

**603.7.3 Flood hazard.** All underground ducts located in a flood-hazard zone or a high-hazard zone shall be located above the base flood elevation or shall be protected so as to prevent water from entering or accumulating within the ducts during floods up to the base flood elevation. If the ducts are located below the base flood elevation, the ducts shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the base flood elevation.

**603.7.4 Plastic ducts and fittings.** Plastic ducts shall be constructed of PVC having a minimum pipe stiffness of 8 psi (55 kPa) at 5-percent deflection when tested in accordance with ASTM D 2412. Plastic duct fittings shall be constructed of either PVC or high-density polyethylene. Plastic duct and fittings shall be utilized in underground installations only. The maximum design temperature for systems utilizing plastic duct and fittings shall be 150°F (66°C).

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**603.8 Joints, seams and connections.** All joints, longitudinal and transverse seams and connections shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic plus embedded fabric systems or tapes. Tapes and mastics used with rigid fibrous ducts shall be listed and labeled in accordance with UL 181A. Tapes and mastics used with flexible air ducts and air connectors shall be listed and labeled in accordance with UL 181B. Duct connections to sheet metal fittings or flanges of air distribution system equipment and appliances shall be mechanically fastened.

**603.9 Supports.** Ducts shall be supported with approved hangers at intervals not exceeding 10 feet (3048 mm) or by other approved duct support systems designed in accordance with the International Building Code. Flexible and other factory-made ducts shall be supported in accordance with the manufacturer's installation instructions.

**603.9.1 For one and two family dwellings and townhomes.** Metal ducts shall be securely supported. Where hung or suspended, metal straps a minimum of 1 inch in width and equivalent to or heavier than the duct being supported shall be used. Straps, when used, shall be at maximum 64-inch intervals and shall be securely attached to the building structure. Straps shall be attached to the duct at a minimum of 2 points with screws or rivets. Hanger systems shall comply with this section or other approved means. Nonmetallic or listed duct systems shall be supported in accordance with the manufacturer's installation instructions. All equipment shall be supported independently of the duct system except when the duct is used as a support base. When used as a support base, the duct shall be of sufficient strength and designed to support the weight of the unit. Listed bases shall be installed in accordance with the manufacturer's installation instructions.

**603.10 Furnace connections.** Ducts connecting to a furnace shall have a clearance to combustibles in accordance with the furnace manufacturer's installation instructions.

**603.11 Condensation.** Provisions shall be made to prevent the formation of condensation on the exterior of any duct.

**603.12 Location.** Ducts shall not be installed in or within 4 inches (102 mm) of the earth, except where such ducts comply with 603.7.

**603.13 Mechanical protection.** Ducts installed in locations where they are exposed to mechanical damage by vehicles or from other causes shall be protected by approved barriers.

**603.14 Weather protection.** All ducts including linings, coverings and vibration isolation connectors installed on the exterior of the building shall be adequately protected against the elements.

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**603.16 Under-floor plenum.** An under-floor space used as a supply plenum shall conform to the requirements of this section. Fuel gas lines and plumbing waste cleanouts shall not be located within the space.

**603.16.1 General.** *The space shall be cleaned of loose combustible materials and scrap, and shall be tightly enclosed. The ground surface of the space shall be covered with a moisture barrier having a minimum thickness of 4 mils (90.102 MM).*

**603.16.2 Materials.** *The under-floor space, including the sidewall insulation, shall be formed by materials having flame-spread ratings not greater than 200.*

**603.16.3 Furnace connections.** *A duct shall extend from the furnace supply outlet to not less than 6 inches (153 mm) below combustible framing. This receptacle shall be installed below the floor opening into the plenum in accordance with the following requirements:*

- 1. The receptacle shall be securely suspended from the floor members and shall not be ore than 18 inches (457 mm) below the floor opening.*
- 2. The area of the receptacle shall extend 3 inches (76 mm) beyond the opening on all sides.*
- 3. The perimeter of the receptacle shall have a vertical lip at least 1 inch (25 mm) high at the open sides.*

**603.16.4 Access.** *Access to an under-floor plenum shall be provided through an opening in the floor with minimum dimensions of 18 inches by 24 inches (457 mm by 610 mm).*

**603.16.5 Furnace controls.** *The furnace shall be equipped with an automatic control that will start the air-circulating fan when the air in the furnace bonnet reaches a temperature not greater than 150°F (93°). The furnace shall additionally be equipped with an approved automatic control that limits the outlet air temperature to 200 degrees F (93 degrees C).*

***Disclaimer: There may be other ways to comply with the Code. If so, you are not required to use this method to comply with the Code. You may want to investigate other options, or consult with a design professional identifying an equally code compliant solution.***

### End Notes

North Carolina Plumbing Code & North Carolina Mechanical Code & North Carolina Fuel Gas Code.  
International Code Council  
Southern Building Code Congress